Endemism.—RIDLEY[14] recently presented a series of criticisms of the work of WILLIS on endemism in Ceylon. WILLIS had attempted to demonstrate by the statistical method that endemics were the most recent rather than the most ancient forms in a given locality. In his criticism RIDLEY objected that the statistics used were inaccurate, pointing out a number of flaws. In addition he presented from his own experience some striking exceptions to the general conclusion of WILLIS. In conclusion, RIDLEY objected to the use WILLIS had made of the mutation theory, RIDLEY himself evidently being a confirmed natural selectionist.

WILLIS[15] has now answered these criticisms in a rather satisfactory way. As to the flaws in his statistics, he points out how they are quantitatively of little significance. As to the applicability of his conclusions, he presents two crucial cases: (1) showing that the widely distributed forms of New Zealand "take no notice" in their distribution of Cook's Strait (of relatively recent origin), while the endemics do; (2) the "local distribution of the highly modified Tristichaceae and Podostemaceae and the cosmopolitan distribution of the little modified forms." As to man's action, changes of climate, and similar disturbing factors which RIDLEY had accused him of neglecting, WILLIS stated that these, although they may exert a disturbing influence, no more affect the validity of his law than does the resistance of air effect the law of gravity. Finally, WILLIS deals with RIDLEY'S theoretical objections merely by pointing out that natural selection cannot explain the origin of the peculiarities which distinguish plants, but can only preserve or destroy them when once formed.

In an accompanying paper SINNOTT[16] raises additional objections to the hypothesis of WILLIS. He says that "other factors than age determine the area occupied by a species." He can hardly claim, however, that this affects the validity of the law. He also states that the data of WILLIS would seem to indicate that woody plants are producing new species faster than are herbs, a conclusion against which there is much evidence; and likewise they would indicate that herbs are the older since they are the more widely distributed. BAILEY and SINNOTT had previously stated and substantiated the contrary view. May not the two ideas be reconciled, however, by the fact that it is the nature of herbs to spread the more rapidly, due to more meager requirements for germination and to more extensive vegetative multiplication? SINNOTT also states that species *are* dying out, due to actual extermination, "which causes the last survivors to appear as 'relic' endemics"; and by "swamping" of isolated members of old species by crossing with newly devel-

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[14] Rev. in BOT. GAZ. **64**:263. 1917.

[15] WILLIS, J. C., The relative age of endemic species and other controversial points. Ann. Botany **31**:189–208. 1917.

[16] SINNOTT, EDMUND W., The "age and area" hypothesis and the problem of endemism. Ann. Botany **31**:209–216. 1917.

oped forms. WILLIS had concluded that species are *not* dying out. In conclusion, SINNOTT emphasizes the complexity of the problem and points out the many factors involved. The complexity of a problem, however, should justify rather than discourage the development of such a theory.—MERLE C. COULTER.

Free ammonia and ammonium salts in plants.—WEEVERS[17] has made a large number of determinations for free ammonia and ammonium salts in tissues of various members of the plant kingdom. Tests for ammonium salts were made as follows: a portion of the plant material (25 mg.) along with a drop of water was placed in the bottom of a collared microscope slide. Some powdered magnesia and a wad of cotton bearing a little chloroform were added. A cover glass bearing a hanging drop of platinic chloride was then placed on the collar. The chloroform killed and rendered the cells permeable, while the magnesium oxide liberated the ammonia from the ammonium salt of the tissues. The ammonia was detected by the $(NH_4)_2Pt\ Cl_6$ crystals in the hanging drop. For the detection of free ammonia only the tissue or the tissue and the chloroform were added along with the hanging drop. Sodium hydrate (20 per cent) could be substituted for magnesia only in case the reaction was rapid, for the former liberates ammonia from amides in a few hours at room temperature. WEEVERS believes he could estimate closely the relative amount of ammonium salts in various tissues by the amount of $(NH_4)_2Pt\ Cl_6$ crystals formed. His estimates tallied with the quantitative determinations that were made in many cases.

Among phanerogams free ammonia was found only in bacterial nodules. In cryptogams it was occasionally found in Hymenomycetes and lichens. Ammonium salts were found in all species examined except in some mycotropic and insectivorous forms naturally growing on acid moorlands poor in ammonium salts. Their absence in these forms is apparently related to the nature of their protein metabolism and not to nitrogen shortage in the soil, as indicated by their behavior in water cultures and by other plants of the same habitat bearing ammonium salts. The amount of ammonium salts present in the leaves of any plant is apparently independent of their presence in the soil. Ammonium salts that are absorbed by the roots from water cultures are quickly transformed and do not influence the amount in the leaves. Many facts indicate that these salts result from protein metabolism, assimilation, and dissimilation. The more vigorous metabolism in any part the more ammonium salts are present. Some plants and plant parts are rather rich in ammonium salts, bearing as much as 2 per cent; certain sea forms (*Noctiluca miliaris*); many hymenomycetes and lichens (excepting lichens on moorlands); certain Liliaceae and Cruciferae (onion and cabbage roots), and root nodules of

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[17] WEEVERS, TH., Das Vorkommen des Ammoniaks und der Ammonsalze an den Pflanzen. Rec. Trav. Bot. Neerland. **13**:63–104. 1916.